

Amendments to the Claims:

1. (Previously Presented) A system for visualizing a three-dimensional (hereinafter "3D") volume, in particular for medical applications; the system including:

an input for receiving a three-dimensional set of data representing
5 voxel values of the 3D image;

a storage for storing the data set;

an output for providing pixel values of a two-dimensional (hereinafter "2D") image for rendering; and

a processor for, under control of a computer program, processing the
10 data set to obtain a 2-dimensional representation of the volume by projecting the volume onto an imaginary 2D projection screen from a predetermined viewpoint by for each pixel of the 2D projection image:

casting a ray from the viewpoint through the pixel and
through the volume;

15 traversing along the ray through at least a plurality of ray positions within the volume under control of a protocol that determines a rendering algorithm and/or rendering parameters in dependence on the ray position with the determined rendering algorithms and/or rendering parameters being different for some ray
20 positions than the determined rendering algorithm and/or rendering parameters for other ray positions; and

for each of the plurality of ray positions using a corresponding one of the determined rendering algorithms/parameters to calculate a contribution to a pixel value of the pixel based on at least
25 one voxel value with a predetermined range of ray positions,

wherein the protocol is rule-based;

wherein a rule prescribes for each of the plurality of ray positions at least one processing action at least in dependence on processing results of ray position along the ray that already been processed wherein the processing action includes at
30 least one of the following:

jumping forward or backward along a ray to a particular ray position, and resuming processing from that position;

switching a stepping direction along a ray between
forward and backward as seen from the viewpoint;
35 changing a step size that determines a next ray position
with respect to a current ray position in the stepping direction;
changing a 3-dimensional direction of a ray starting
from a particular position;
switching to another rendering algorithm;
40 adapting rendering parameters for controlling the
rendering algorithm;
switching to another feature detection method, which
determines the type of information that is going to be visualized by the
rendering algorithm.

2. (Previously Presented) A system for visualizing a three-
dimensional (hereinafter "3D") volume of a patient, the system including:

an input which receives a three-dimensional set of medical image data
representing voxel values of the 3D volume;

5 at least one storage which stores protocols for switching among a
plurality of feature detection methods and which stores the medical image data set;

an output which provides pixel values of a two-dimensional
(hereinafter "2D") image representation for rendering; and

a processor which, under control of a computer program, processes the
10 medical image data set to obtain the 2D image representation by performing the steps
of:

casting a ray from each pixel of the 2D image
representation through the volume;

15 traversing along each ray through at least a plurality of
ray positions within the volume;

in accordance with one of the stored protocols selected
to select a type of information visualization, selecting one of the
plurality of feature detection methods, in dependence on the ray
position, the selected one of the plurality of feature detection methods
20 changing with the ray position, the selected feature detection method

being different for some of the ray positions of the 2D image than for other ray positions of said 2D image;

25 for each of the plurality of ray positions, calculating a contribution to a corresponding pixel value based on at least one voxel value within a predetermined range of the ray position using the selected one of the feature detection methods for each of the ray positions.

3. (Previously Presented) The system as claimed in claim 2, wherein the selecting of one of the plurality of feature detection methods is based on a-priori knowledge of at least one of the following: the volume, the medical situation, the clinical situation based on at least one of anatomical, medical and clinical
5 knowledge of a medical expert.

4. (Previously Presented) The system as claimed in claim 2, further including a 3D model of at least one object in the volume, the used one of the plurality of feature detection methods being selected in accordance with a relationship between each ray position and the at least one object of the 3D model.

5. (Previously Presented) The system as claimed in claim 2, wherein the selected feature detection method is rule-based, such that based on a rule, a processing action is selected based on the ray position, the processing action being selected among:
5 stepping direction along the ray,
 changing a step size over a portion of the ray,
 changing a 3D direction of the ray starting at a selected ray position.

6. (Previously Presented) The system as claimed in claim 5, wherein a rule prescribes that, for each of the plurality of ray positions, at least one processing action changes in dependence on processing results of ray positions along the ray that have already been processed.

7. (Previously Presented) The system as claimed in claim 2, wherein each of the protocols corresponding to one of a plurality of anatomical regions of the patient.

8. (Previously Presented) The system as claimed in claim 2, wherein the computer program is operative to cause the processor to:

enable a human operator to select at least one protocol from the plurality of stored protocols for processing the volume; and

5 store a selection of the human operator in association with an identity of the operator for subsequent retrieval.

9. (Previously Presented) The system as claimed in claim 2, wherein the computer program is operative to cause the processor to change the selected feature detection method along the ray such that the corresponding pixel value is calculated using a plurality of feature detection methods.

10. (Previously Presented) A non-transitory computer readable storage medium storing a computer program for controlling a processor to process a three-dimensional set of medical data representing voxel values of a 3D volume depicting an anatomical region of a patient to obtain a 2D image having a plurality of
5 pixels of the 3D volume by projecting the 3D volume onto an imaginary 2D projection screen by controlling the processor to perform the steps of:

from a memory which stores a plurality of rendering algorithms, selecting a subset of the rendering algorithms in accordance with an anatomical region depicted by the 3D volume;

10 casting a ray through each pixel of the 2D image and into the 3D volume;

stepping along the ray through a plurality of ray positions along the ray within the volume under control of a protocol that selects one of the subset of rendering algorithms to be implemented for each ray position along the ray, the

15 rendering algorithm selected for some ray positions being different than the rendering
algorithm selected for other ray positions along the ray; and
for each of the plurality of ray positions using the selected rendering
algorithm to calculate a contribution to a pixel value of the pixel corresponding to the
ray based on at least one voxel value within a predetermined range of the ray position,
20 wherein a plurality of different rendering algorithms are used to
generate the pixel values of the 2D image from the voxels of the 3D volume.

11. (Currently Amended) A method of visualizing a 3D volume
representing an anatomical region of a patient, which 3D volume is defined by a
three-dimensional set of data representing voxel values of a 3D array of voxels of the
3D volume, as a 2D image defined by pixel values of a 2D array of pixels of a 2D
5 image on an imaginary 2D projection screen, the method comprising:

with one or more processors:

casting a ray from each pixel into the 3D volume;

stepping along the ray to each of a plurality of ray
positions within the volume under control of a protocol that selects one
10 of a plurality of rendering algorithms/parameters in dependence on (1)
the ray position along the ray and (2) the anatomical region of the
patient represented by the ray position and (3) a medical or clinical
situation;

for some of the ray positions along the ray, selecting
15 different rendering algorithms/parameters than for other ray positions
along the ray wherein the selected rendering algorithm/parameter for at
least one of the ray positions along the ray changes to a different
rendering algorithm/parameter;

for each of the plurality of ray positions along the ray
20 using the selected one of the plurality of rendering
algorithms/parameters to calculate a contribution to the pixel value of
the pixel of the 2D image that corresponds to the ray; and

at least one of displaying the 2D image on a display
monitor and storing the 2D image in a computer memory;

25 wherein the different rendering algorithm/parameter includes at least
one of:

 switching a stepping direction along the ray;
 jumping forward or backward along the ray to a
 particular ray position, and ~~resumes~~ resuming processing from that ray
30 position;

 changing a step size that determines a next ray position
 with respect to a current ray position in the stepping direction;

 changes a 3-dimensional direction of a ray starting from
 a current ray position; and

35 determines a type of anatomical information that is
 going to be visualized by the rendering algorithm in the 2D image.

12. (Currently Amended) The method as claimed in claim 11,
further including:

 referencing a 3D model that models typical anatomical structure in the
 anatomical region represented by the 3D volume; and

5 selecting the rendering algorithm/parameter based on the typical
 anatomical structure ~~predicts~~ predicted at each ray position along the ray.

13. (Previously Presented) The method as claimed in claim 11,
wherein selecting the rendering algorithm is based on at least one of:

 processing results at prior ray positions along the ray; and
 a 3D model that models anatomical structure represented by the 3D
volume.